



Huntington Power Plant

6 miles west of Huntington, Utah on Hwy. 31
P.O. Box 680
Huntington, Utah 84528

September 16, 2016

Mr. Bryce Bird, Director
Utah Department of Environmental Quality
Division of Air Quality
195 North 1950 West
P.O. Box 144820
Salt Lake City, UT 84114-4820

RE: **3rd Quarter, 2016 Particulate Matter Compliance Test Report - 40 CFR 63 SubPart UUUUU,
Huntington Power Plant Unit 1 and Unit 2 (Title V Permit #1501001004)**

Dear Mr. Bird,

In accordance with Title V Permit Condition II.B.3.f.1(b) and 40 CFR §63.10021(d) the Huntington Power Plant submits these 3rd Quarter 2016 Particulate Matter (PM) Compliance Test Reports for Unit 1 and Unit 2. 40 CFR §63.10031(f)(6) requires the submittal of compliance test results that were generated prior to April 16, 2017. This submittal is intended to satisfy the report submittal for Huntington Unit 1 and Unit 2, and includes the portable document format (PDF) report that is submitted electronically via the Emissions Collection and Monitoring Plan System (ECMPS).

The summary results of the 3rd Quarter 2016 PM test results are:

Unit	Emission rate (lb/mmBtu)
1	0.004
2	0.002

I am authorized to make this submission on behalf of the owners and operators of the affected source or affected units for which the submission is made. I certify under penalty of law that I have personally examined, and am familiar with, the statements and information submitted in this document and all its attachments. Based on my inquiry of those individuals with primary responsibility for obtaining the information, I certify that the statements and information are to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false statements and information, or omitting statements and information, including the possibility of fine or imprisonment.

Should you have any questions regarding this information, please contact Richard Neilson, Huntington Power Plant Environmental Engineer at (435) 687-4334 or me at (435) 687-4211.

Sincerely,

Darrell Cunningham
Managing Director and Responsible Official, Huntington Plant

Enclosures: Emissions Testing Report for PacifiCorp Huntington Unit 1 – Particulate Matter Compliance Testing
Emissions Testing Report for PacifiCorp Huntington Unit 2 – Particulate Matter Compliance Testing



Emissions Testing Report for PacifiCorp
Huntington Unit 1
Huntington, Utah

Particulate Matter Compliance Testing

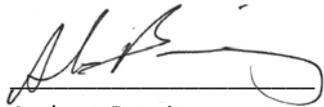
40 CFR Part 63, Subpart UUUUU

Test Date: August 23, 2016

Project Code PC16-0001.15

Certification Statement

I certify that all field data were acquired under my direction in accordance with a system designed to assure data quality. Based on reasonable inquiry, the information submitted is to the best of my knowledge true, accurate and complete.



Andrew Bruning
Senior Project Manager
Emissions Measurement Company

I certify that this document and all attachments were prepared under my direction in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on reasonable inquiry, the information submitted is to the best of my knowledge true, accurate and complete.



Matthew Parks
Technical Director
Emissions Measurement Company

Executive Summary

EMCo was contracted by PacifiCorp to conduct compliance testing at the Huntington Power Plant near Huntington, Utah. Testing was performed to determine emission rates of particulate matter (PM) from the exhaust stack of Huntington Unit 1. Compliance test results are summarized in the table below; detailed test results are given in the following report.

PacifiCorp Huntington Power Plant PM Compliance Test Results Summary				
Source	Parameter	Date	Average Value	Emission Limit
Huntington Unit 1	Filterable Particulate Matter	8/23/2016	0.004	0.030 lb/mmBtu
			0.04	0.30 lb/MW-hr
Each result is the average of three two-hour test runs.				
<u>Abbreviations:</u> lb/mmBtu: pounds per million British thermal units lb/MW-hr: pounds per megawatt hour				

Introduction

EMCo was contracted by PacifiCorp to conduct source testing services at the Huntington Power Plant near Huntington, Utah. The Huntington Plant comprises two pulverized coal-fired boilers. Huntington Unit #1 is equipped with low-NO_x burners and overfire air for nitrogen oxides (NO_x) control, a flue gas desulfurization (FGD) scrubber for sulfur dioxide (SO₂) control and pulse-jet fabric filters for particulate matter (PM) control. Testing was conducted in accordance with the requirements of 40 CFR Part 63 Subpart UUUUU, National Emission Standards for Hazardous Air Pollutants (NESHAP): Coal- and Oil-Fired Electric Utility Steam Generating Units.

Contact information for the project is listed in the table below.

Contact	Affiliation	Telephone	E-mail
Frank Zampedri Environmental Analyst	PacifiCorp	(801) 220-2169	frank.zampedri@pacificorp.com
Richard Neilson Environmental Engineer		(435) 687-4334	richard.neilson@pacificorp.com
Rob Leishman Environmental Scientist	UDEQ	(801) 536-4438	rleishman@utah.gov
Andrew Bruning Senior Project Manager	EMCo	(303) 810-2168	abruning@stacktest.us

Scope of Work

Testing was performed to determine concentrations and mass emission rates of particulate matter (PM) for comparison to the applicable emission limits listed in the table below.

Source	Regulation	Parameter	Emission Limit
Huntington Unit 1	NESHAP UUUUU	PM (lb/mmBtu)	0.030 lb/mmBtu
		PM (lb/MW-hr)	0.30 lb/MW-hr
<u>Abbreviations:</u> lb/mmBtu: pounds per million British thermal units lb/MW-hr: pounds per megawatt-hour			

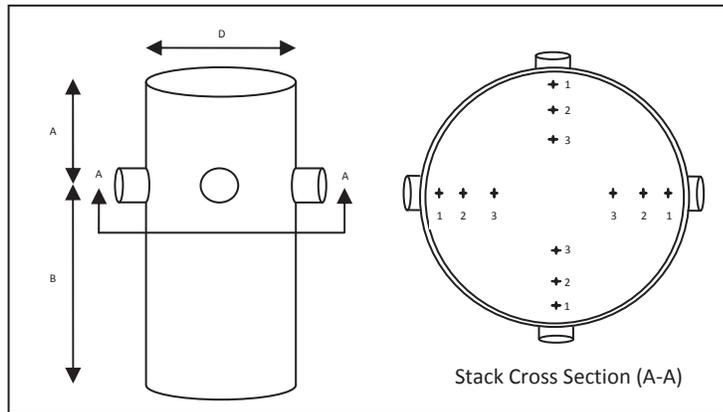
Testing Methods

EMCo used the following EPA Reference Methods for the testing program. No deviations from the Reference Methods were noted.

Parameter	EPA Reference Methods	Test Runs/Duration	Target Sample Volume
PM (lb/mmBtu)	1, 2, 3B, 4, 5*, 19	3 @ 2 hr	2 dscm (70.63 dscf)**
*In accordance with Table 5 of NESHAP Subpart UUUUU, the front-half temperature was set at 320° ± 25°F. **Sample volume from Table 2 of NESHAP Subpart UUUUU, doubled in accordance with §63.10005.			

Testing Location

The Huntington Unit #1 exhaust sampling location consists of a vertical, circular stack with four orthogonal sampling ports located at least six diameters downstream and two diameters upstream of the nearest flow disturbances. PM testing was performed across a grid of 12 points determined using EPA Method 1. See the schematic below.



Huntington Test Diagram	
Unit #	1
Diameter (D)	323.3"
Upstream Distance (A)	>220'
Downstream Distance (B)	>266'
Sample Point Distances from Stack Wall	
Traverse Point 1	14.1"
Traverse Point 2	47.3"
Traverse Point 3	95.7"

Test Results

The results of the testing program are given in the tables below. Detailed test results are located in Appendix A, along with sample calculations for all computed values.

PacifiCorp Huntington Unit 1 PM Compliance Test Results Summary (8/23/2016)						
Parameter	Run #1	Run #2	Run #3	Average	QA Specification	Emission Limit***
Start Time	6:02	8:30	11:15	—	—	—
Stop Time	8:14	10:46	13:40	—	—	—
Sample Gas Volume (dscf)	88.71	86.61	87.09	87.47	>70.63*	—
Isokinetic Variation (%)	103.3	102.7	103.5	103.2	100 ± 10%	—
Filterable PM (lb/mmBtu)	0.001	0.007	0.005	0.004	—	0.030
Boiler Load (MW)	477	477	477	477	>468**	—
Filterable PM (lb/MW-hr)	0.01	0.07	0.05	0.04	—	0.30

* Sample volume from Table 2 of NESHAP Subpart UUUUU, doubled in accordance with §63.10005.
 **90% of design capacity, in accordance with §63.10007(a)(2).
 ***As shown, average PM emissions were less than 50% of the applicable emission limit, qualifying the unit for Low Emitting EGU (LEE) status.

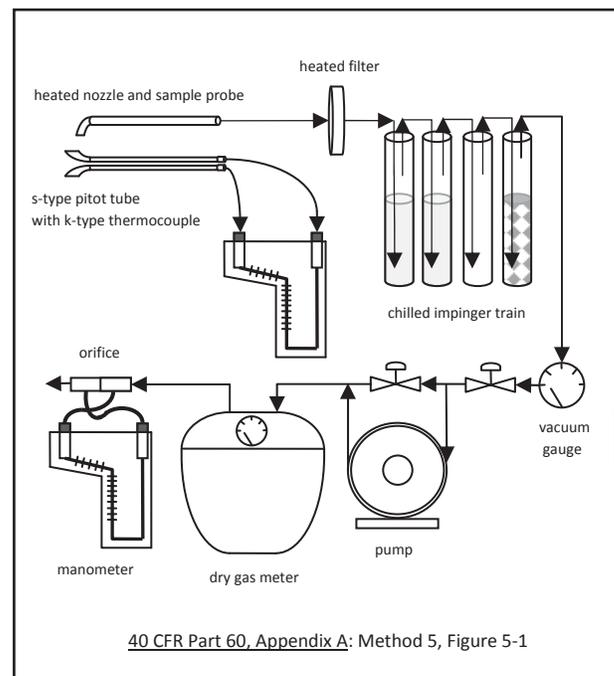
Testing Equipment

All testing equipment was housed in a climate-controlled mobile analytical laboratory designed and built by EMCo. All required quality assurance tests were performed as required by the applicable Reference Methods. Detailed equipment descriptions are given in the table below.

Parameter	Equipment	EPA Reference Method(s)
Particulate Matter (PM)	Heated probe with glass nozzle and stainless steel probe liner Quartz fiber filter S-type pitot tube K-type thermocouple Inclined-vertical manometer Dry gas meter Digital scale Analytical balance	1, 2, 3B, 4, 5, 19

Test Details

Particulate matter testing was performed using EPA Methods 1, 2, 3B, 4 and 5. Each test run was 120 minutes in duration. Sampling was performed along a grid of points determined using EPA Method 1. Exhaust gas flow measurements were taken using an S-type pitot tube, K-type thermocouple and inclined-vertical manometer in accordance with EPA Method 2. A sample of exhaust gas was withdrawn from the stack at an isokinetic flow rate through a heated stainless steel nozzle and probe, through a heated quartz-fiber filter, through four chilled glass impingers containing known masses of water or silica gel, and through a dry gas meter. (See Figure 5-1 at right.) The default dry molecular weight for combustion sources (30 lbs/lb-mole) listed in EPA Method 3 was combined with pressure and temperature measurements to calculate stack gas velocity in accordance with EPA Method 2. Stack gas moisture concentrations were determined gravimetrically in accordance with EPA Method 4. Following each sampling period, the filter and rinses of the nozzle and probe were recovered and returned to EMCo's laboratory for gravimetric analysis. Following analysis, the particulate mass captured during each test run was combined with concurrent flow and moisture data to calculate particulate matter emissions in units of pounds per hour (lb/hr). The particulate mass captured during each test run was combined with concurrent CO₂ concentration data from the plant CEMS¹ and the appropriate fuel F-factor from EPA Method 19 (1,800 scf/mmBtu) to calculate PM emissions in units of pounds per million British thermal units (lb/mmBtu) for comparison to the applicable emission limit.



¹ EPA Method 3B §6.0 states "As an alternative to the sampling apparatus and systems described herein, other sampling systems may be used, provided such systems are ... capable of yielding acceptable results." As NESHAP UUUUU requires certified Part 75 CEMS CO₂ data to calculate SO₂ and mercury emissions in units of lb/mmBtu, CEMS CO₂ data are considered acceptable for PM emission calculations as well.

Appended Information

Supporting data for this testing program are included as follows.

Appendix A: Test Summary

- Data Reduction Spreadsheet
- Sample Calculations

Appendix B: Field Data

- Field Datasheets

Appendix C: Laboratory Data

- Gravimetric Analysis

Appendix D: CEMS Data

- Test Run CEMS Printouts

Appendix E: Calibration Information

- Dry Gas Meter Pre-Test and Post-Test Calibrations
- Critical Orifice Calibration Certificate
- AETB Certification



Project PC16-0001.15
Appendix A: Test Summary
Data Reduction Spreadsheets
Sample Calculations

	Run #	1	2	3	
	Start Time	6:02	8:30	11:15	
	Stop Time	8:14	10:46	13:40	
Ø	Sample Time (min.)	120	120	120	
EPA Method 2 Data					
		1	2	3	Average
Inputs					
D _s	Stack Diameter (inches)	323.3	323.3	323.3	323.3
P _{bar}	Barometric Pressure ("Hg)	23.8	23.8	23.8	23.80
P _g	Stack Static Pressure ("H ₂ O)	-2.4	-2.4	-2.4	-2.4
C _p	Pitot Tube Coefficient (unitless)	0.84	0.84	0.84	0.84
√ΔP _{avg}	Avg. Velocity Head of Stack Gas v("H ₂ O)	0.8791	0.8668	0.8659	0.8706
T _s	Stack Gas Temperature (°F)	114	115	115	115
Calculations					
A	Stack Area (ft ²)	570.084	570.084	570.084	570.084
P _g	Stack Static Pressure ("Hg)	-0.18	-0.18	-0.18	-0.18
M _d	Stack Gas Molecular Weight, dry basis (lb/lb-mole)	30.00	30.00	30.00	30.00
M _s	Stack Gas Molecular Weight, wet basis (lb/lb-mole)	28.61	28.56	28.55	28.58
P _s	Absolute Stack Pressure ("Hg)	23.62	23.62	23.62	23.62
T _{s(abs)}	Absolute Stack Gas Temperature (°R)	574	575	575	575
V _s	Stack Gas Velocity (ft/sec)	58.2	57.5	57.4	57.7
Q	Stack Gas Dry Volumetric Flow Rate (dscf/hr)	76,691,399	75,262,703	75,108,565	75,687,556
Q	Stack Gas Dry Volumetric Flow Rate (dscf/min)	1,278,190	1,254,378	1,251,809	1,261,459
CEMS Diluent Data					
		1	2	3	Average
	CO ₂ (%vvv)	10.6	10.3	10.4	10.4
	CO ₂ (%vd)	12.0	11.7	11.8	11.8
EPA Method 4 Data					
		1	2	3	Average
Inputs					
V _{lc}	Volume of Water Condensed (mL)	246.3	250.3	254.3	250.3
V _m	Volume of Stack Gas Collected (dcf)	113.449	111.817	112.85	112.705
Y	Meter Calibration Factor (unitless)	1.0008	1.0008	1.0008	1.0008
ΔH	Pressure Differential Across Orifice ("H ₂ O)	2.2	2.1	2.1	2.1
T _m	Temperature at Gas Meter (°F)	81	86	88	85
Calculations					
P _m	Absolute Pressure at Gas Meter ("Hg)	23.96	23.95	23.95	23.96
T _m	Absolute Temperature at Gas Meter (°R)	541	546	548	545.0
V _{wc(std)}	Volume of Water Condensed (scf)	11.59	11.78	11.97	11.78
V _{m(std)}	Sample Gas Volume (dscf)	88.71	86.61	87.09	87.47
B _{ws act}	Observed Stack Gas Moisture Content (%/100)	0.116	0.120	0.121	0.119
B _{ws sat}	Saturated Moisture Content (%/100)	0.123	0.127	0.127	0.126
B _{ws}	Moisture Content Used (%/100)	0.116	0.120	0.121	0.119
EPA Method 5 Data					
		1	2	3	Average
Inputs					
D _n	Nozzle diameter (")	0.242	0.242	0.242	0.242
C1	Mass of PM collected on filter (mg)	2.5	4.7	5.2	4.1
C2	Mass of PM collected in rinses (mg)	0.1	12.5	7.9	6.8
Emission Calculations					
F _c	Fuel F-Factor (scf/mmBtu)	1800	1800	1800	1800
A _n	Cross-sectional area of nozzle (ft ²)	3.19E-04	3.19E-04	3.19E-04	3.19E-04
l	Isokinetic variation (%)	103.3	102.7	103.5	103.2
m _n	Total Filterable PM mass less blank (mg)	2.6	17.2	13.1	11.0
C _s	Filterable Particulate concentration (gr/dscf)	0.000	0.003	0.002	0.002
C _s	Filterable Particulate concentration (lb/dscf)	6.46E-08	4.38E-07	3.32E-07	2.78E-07
E _{lb/hr}	Filterable Particulate mass emission rate (lb/hr)	5	33	25	21
	Boiler Load (MW)	477	477	477	477
	Filterable Particulate mass emission rate (lb/MW-hr)	0.01	0.07	0.05	0.04
F _c	Filterable Particulate mass emission rate (lb/mmBtu)	0.001	0.007	0.005	0.004
8760 hrs/yr	Filterable Particulate mass emission rate (tons/year)	22	144	109	92

EPA Method 5: Determination of Particulate Matter Emissions (40 CFR Part 60, Appendix A-1)

Variables

Variable	Value	Definition	Unit of Measurement
D _s	323.3	Stack Diameter	inches
A	570.08	Cross-Sectional Area of the Stack	ft ²
P _g	-2.40	Stack Static Pressure	in. H ₂ O
P _g	-0.18	Stack Static Pressure	in. Hg
%CO ₂	12.0	Concentration of Carbon Dioxide	Dry Volume Percent (%vd)
M _d	30.00	Dry Molecular Weight of the Stack Gas (default)	lb/lb-mole
P _{bar}	23.80	Barometric Pressure	in. Hg
ΔH	2.20	Pressure Differential across Orifice	in. H ₂ O
P _m	23.96	Absolute Pressure at Gas Meter	in.Hg
t _m	81	Temperature at Gas Meter	°F
T _m	541	Absolute Temperature at Gas Meter	°R
K1	0.04706	Conversion Factor	ft ³ /mL
V _{ic}	246.3	Volume of Water Condensed	g
V _{wc(std)}	11.59	Volume of Water Condensed	scf
K ₄	17.64	Constant	°R/in.Hg
Y	1.0008	Meter Calibration Factor	Unitless
V _m	113.449	Volume of Stack Gas Collected	dcf
V _{m(std)}	88.709	Sample Gas Volume	dscf
B _{ws}	0.116	Stack Gas Moisture Content	%/100
M _s	28.61	Actual Molecular Weight of the Stack Gas	lb/lb-mole
P _s	23.62	Absolute Stack Pressure	in. Hg
T _s	114	Average Stack Temperature	°F
T _{s(abs)}	574	Average Absolute Stack Temperature	°R
Kp	85.49	Conversion Factor	(ft/sec) x √(((lb/lb-mole)(in.Hg))/((°R)(in.H ₂ O)))
C _p	0.84	Pitot Coefficient	Dimensionless
Avg√Δp	0.8791	Average Square Root of Velocity Head Readings	in. H ₂ O
V _s	58.17	Average Stack Gas Velocity	ft/sec
T _{std}	528	Standard Absolute Temperature	°R
P _{std}	29.92	Standard Absolute Pressure	in. Hg
Q	76,691,399	Dry Volumetric Flow Rate Corrected to Standard Conditions	dscf/hr
D _n	0.242	Nozzle Diameter	inches
A _n	3.19E-04	Cross-Sectional Area of the Nozzle	ft ²
m _n	2.60	Total PM and CPM Mass	mg
C _s	6.46E-08	Particulate Concentration	lb/dscf
E _{lb/hr}	5.0	PM Mass Emission Rate	pounds per hour
F _c	1800	F-Factor from EPA Method 19	scf/mmBtu
E _{lb/mmBtu}	0.001	PM Mass Emission Rate	pounds per million Btu
E _{tons/yr}	21.7	PM Mass Emission Rate	tons per year
K5	0.0945	Constant	(in.Hg · min) / (°R · sec)
Θ	120	Sample Time	minutes
I	103.3 %	Isokinetic variation	percent

EPA Method 5: Determination of Particulate Matter Emissions (40 CFR Part 60, Appendix A-1)

$$A = \pi(D_s/24)^2$$

$$= \pi(323.3/24)^2$$

$$= 570.08 \text{ ft}^2$$

$$P_g = P_g/13.6$$

$$= -2.4/13.6$$

$$= -0.18 \text{ in. Hg}$$

$$M_d = 30.00 \text{ lb/lb-mole}$$

$$P_m = P_{\text{bar}} + (\Delta H/13.6)$$

$$= 23.8 + (2.2/13.6)$$

$$= 23.96 \text{ in. Hg}$$

$$T_m = 460 + t_m$$

$$= 460 + 81$$

$$= 541 \text{ R}$$

$$V_{\text{wc(std)}} = K_1 \times V_{\text{lc}}$$

$$= 0.04706 \times 246.3$$

$$= 11.59 \text{ scf} \quad (\text{Eq. 4-1})$$

$$V_{\text{m(std)}} = \frac{K_4 \times Y \times V_m \times P_m}{T_m}$$

$$= \frac{17.64 \times 1.0008 \times 113.449 \times 23.96}{541}$$

$$= 88.71 \text{ dscf} \quad (\text{Eq. 4-3})$$

$$B_{\text{ws}} = \frac{V_{\text{wc(std)}}}{V_{\text{wc(std)}} + V_{\text{m(std)}}$$

$$= \frac{11.59}{11.59 + 88.71}$$

$$= 0.116 \text{ (\%/100)} \quad (\text{Eq. 4-4})$$

$$M_s = M_d \times (1 - B_{\text{ws}}) + (18.0 \times B_{\text{ws}})$$

$$= 30.00 \times (1 - 0.116) + (18.0 \times 0.116)$$

$$= 28.61 \text{ lb/lb-mole} \quad (\text{Eq. 2-6})$$

$$P_s = P_{\text{bar}} + P_g$$

$$= 23.8 + (-0.18)$$

$$= 23.62 \text{ in. Hg}$$

$$T_{\text{s(abs)}} = 460 + T_s$$

$$= 460 + 114$$

$$= 574 \text{ R}$$

EPA Method 5: Determination of Particulate Matter Emissions (40 CFR Part 60, Appendix A-1)

$$V_s = K_p \times C_p \times \text{Avg} \sqrt{\Delta p} \times \sqrt{\frac{T_{s(\text{abs})}}{(P_s \times M_s)}}$$

$$= 85.49 \times 0.84 \times 0.8791 \times \sqrt{\frac{574}{(23.62 \times 28.61)}}$$

$$= \mathbf{58.2 \text{ ft/sec}} \quad (\text{Eq. 2-7})$$

$$Q = 3600 \times (1 - B_{ws}) \times (V_s) \times (A) \times \frac{(T_{\text{std}} \times P_s)}{(T_{s(\text{abs})} \times P_{\text{std}})}$$

$$= 3600 \times (1 - 0.116) \times (58.17) \times (570.08) \times \frac{(528 \times 23.62)}{(574 \times 29.92)}$$

$$= \mathbf{76,691,399 \text{ dscf/hr}} \quad (\text{Eq. 2-8})$$

$$A_n = \pi(D_n/24)^2$$

$$\pi(0.242/24)^2$$

$$= \mathbf{3.19E-04 \text{ ft}^2}$$

$$C_s = \frac{m_n}{(\text{mg/g}) (\text{g/lb}) (V_{m(\text{std})})}$$

$$= \frac{2.6}{(1000) (453.592) (88.709)}$$

$$= \mathbf{6.46E-08 \text{ lb/dscf}}$$

$$E_{\text{lb/hr}} = C_s \times Q$$

$$= 6.46E-08 \times 76691399$$

$$= \mathbf{5.0 \text{ lb/hr}}$$

$$E_{\text{lb/mmBtu}} = \frac{C_s \times F_c \times 100}{(\text{CO}_2\% \text{vd})}$$

$$= \frac{6.46E-08 \times 1800 \times 100}{(12.0)}$$

$$= \mathbf{0.001 \text{ lb/mmBtu}}$$

$$E_{\text{tons/yr}} = \frac{E_{\text{lb/hr}} \times (\text{Hrs/yr})}{(\text{lbs/ton})}$$

$$= \frac{4.96 \times 8,760}{2000}$$

$$= \mathbf{21.7 \text{ tons/year}}$$

$$I = \frac{K5 \times T_{s(\text{abs})} \times V_{m(\text{std})} \times 100}{P_{s(\text{abs})} \times V_s \times A_n \times \Theta \times (1 - B_{ws})}$$

$$= \frac{0.0945 \times 574 \times 88.709 \times 100}{23.62 \times 58.17 \times 3.2E-04 \times 120 \times (1 - 0.116)}$$

$$= \mathbf{103.3 \%}$$

(Eq. 5-7)



Project PC16-0001.15
Appendix B: Field Data
Field Datasheets

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Emissions Measurement Company: Method 5 Data Sheet

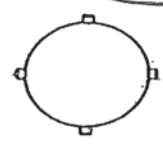
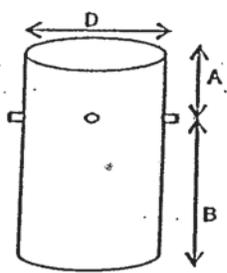
EMCo Job #: PC16-01	Operator(s): CW
Client: Pacificon Huntington	Barometric pressure ("Hg): 24.30 23.8
Source: Unit 1	Static pressure ("H ₂ O): -2.4
Date: 8/23/16	Leak Check ("H ₂ O @ Vac): 0.00 @ 12"
Run #: 2	Leak Check ("H ₂ O @ Vac): 0.00 @ 12"
Meterbox ID: MS-3	Pitot ID / Coeff: .84
Meterbox Y = 1.0008 ΔH = 1.80	Pitot Leak Check: ✓
O ₂ %: 7.1	Nozzle Diameter: .242
CO ₂ %: 11.6	K Factor: 2.81
Start Time: 0830	Stop Time: 1046

Impinger Weights (x.x g)	Initial	Final
Impinger 1		
Impinger 2		
Impinger 3		
Impinger 4 (SG)		
Total	853.0	1103.3
Total	250.3	

Traverse Point	Sample Time	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Velocity Ap ("H ₂ O)	Orifice Pressure ΔH ("H ₂ O)	Vacuum ("Hg)	Sample Volume (ft ³)	DGM Temp (°F)		Imp. Outlet Temp (°F)
									Inlet	Outlet	
								989.288			
①	1	115	318	320	0.62	1.7	4	997.6	85	83	57
	2	115	319	320	0.80	2.2	5	007.2	86	83	59
	3	114	319	321	0.80	2.2	5	006.5	87	84	59
②	1	114	320	320	0.65	1.8	4	025.1	87	84	50
	2	114	319	319	0.80	2.2	5	034.6	88	84	53
	3	114	320	320	0.84	2.4	5	044.4	88	85	56
③	1	114	319	320	0.66	1.9	5	053.5	88	85	59
	2	115	319	319	0.77	2.2	5	063.1	89	85	59
	3	115	320	320	0.82	2.3	5	072.9	89	86	60
④	1	115	320	320	0.67	1.9	4	082.2	89	85	55
	2	115	319	321	0.80	2.2	5	091.2	90	85	57
	3	115	319	320	0.81	2.3	5	101.05	90	86	58
Total	120	115	318	319	0.867	2.1	5	411.805	86.3		60
		Average	Minimum	Minimum	Ave. Vpd	Average	Max.	Total	Average		Maximum
					8668			111.817			

Stack Schematic

Stack Diameter (D)=
 Distance A=
 Distance B=



Point #	Dist. From Stack Wall
1	
2	
3	
4	
5	
6	
7	
8	

mp

Emissions Measurement Company: Method 5 Data Sheet

EMCo Job #: <u>PC16-01</u>	Operator(s): <u>CW</u>
Client: <u>Pacificor Huntington</u>	Barometric pressure ("Hg): <u>23.80</u>
Source: <u>Unit 1</u>	Static pressure ("H ₂ O): <u>-2.4</u>
Date: <u>8/23/16</u>	Leak Check ("H ₂ O @ Vac): <u>0.00 @ 11"</u>
Run #: <u>3</u>	Leak Check ("H ₂ O @ Vac): <u>0.00 @ 12"</u>
Meterbox ID: <u>MS-3</u>	Pitot ID / Coeff: <u>0.84</u>
Meterbox Y = <u>1.0008</u> ΔH@ = <u>1.50</u>	Pitot Leak Check: <u>✓</u>
O ₂ %: <u>7.1</u>	Nozzle Diameter: <u>0.242</u>
CO ₂ %: <u>11.6</u>	K Factor: <u>2.83</u>
Start Time: <u>1115</u>	Stop Time: <u>1151 14 1340</u>

Impinger Weights (x.x g)	Initial	Final
Impinger 1		
Impinger 2		
Impinger 3		
Impinger 4 (5G)		
Total	<u>830.2</u>	<u>1084.5</u>
		<u>254.3</u>

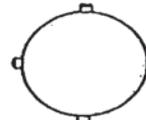
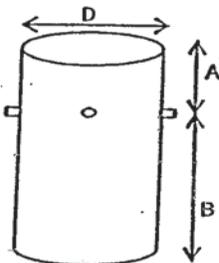
Traverse Point	Sample Time	Stack Temp (°F)	Probe Temp (°F)	Filter Temp (°F)	Velocity Δp ("H ₂ O)	Orifice Pressure ΔH ("H ₂ O)	Vacuum ("Hg)	Sample Volume (ft ³)	DGM Temp (°F)		Imp. Outlet Temp (°F)
									Inlet	Outlet	
①	1 10	115	319	321	0.66	1.9	4	101.615			
	2 20	115	320	320	0.79	2.2	5	110.4	88	84	48
	3 30	115	320	320	0.82	2.3	5	129.8	88	84	55
②	1 40	115	319	320	0.63	1.8	4	138.5	89	85	51
	2 50	116	320	320	0.75	2.1	5	147.9	89	86	49
	3 60	116	319	320	0.81	2.3	5	157.7	90	86	50
③	1 70	115	319	320	0.68	1.9	4	166.7	91	86	51
	2 80	116	320	320	0.78	2.2	5	176.6	91	87	50
	3 90	115	319	320	0.80	2.3	5	186.0	92	87	49
④	1 100	116	319	319	0.64	1.8	4	194.8	92	87	49
	2 110	115	320	321	0.82	2.3	5	204.3	92	87	50
	3 120	115	319	320	0.84	2.4	5	214.465	92	88	50
12	120	115	319	319	0.8659	2.1	5	112.850	88.1		56
Total	Total	Average	Minimum	Minimum	Avg VAp	Average	Max.	Total	Average		Maximum

Stack Schematic

Stack Diameter (D)=

Distance A=

Distance B=



Point # Dist. From Stack Wall

1	
2	
3	
4	
5	
6	
7	
8	



Project PC16-0001.15
Appendix C: Lab Data
Gravimetric Analysis

Project Code:	PC16-1.15
Date Finalized:	9/6/2016
Analyst:	Parks

Laboratory Results Summary	
Sample ID	Filterable Particulate Matter (mg)
Huntington Unit 1, Run #1	2.6
Huntington Unit 1, Run #2	17.2
Huntington Unit 1, Run #3	13.1
No blank corrections were performed.	

Analytical Narrative

Quartz fiber filters were dessicated and tared to a constant weight in the EMCo laboratory prior to sampling. Following testing, the filters were dessicated for at least 24 hours, then weighed to a constant weight (± 0.5 mg). The acetone rinses were measured to the nearest milliliter, transferred to tared aluminum weighing dishes, taken to dryness under a fume hood, then weighed to a constant weight (± 0.5 mg). Each result above represents total filterable particulate matter for each test run (acetone rinse + filter catch), with no blank correction performed unless otherwise indicated.

Instrumentation

All measurements were taken using a Torbal Model AGCN200 Analytical Balance under laboratory conditions. The instrument is auto-calibrated and challenged with three NIST-traceable reference weights daily.

Detection Limit / Sensitivity

All measurements are recorded to 0.0001g (0.1mg).

Notes

No deviations from the analytical procedure from EPA Method 5 were noted. All samples were received in good condition. After analysis, all samples are archived for a period of one year.

Attachments

- Gravimetric Analysis Logs
- Sample Chain of Custody

EPA Method 5 Gravimetric Analysis Log

Project Code: PC16-1.15
Unit ID: Huntington Unit 1

Front-Half Particulate Matter Filter Catch

	Run #1		Run #2		Run #3	
Filter #	1002		1001		1003	
	Date	Weight (g)	Date	Weight (g)	Date	Weight (g)
Final Weight	8/29/16	0.3869	8/29/16	0.3867	8/29/16	0.3894
Tare Weight (g)	2/10/16	0.3844	2/10/16	0.382	2/10/16	0.3842
Filter Catch (g)	0.0025		0.0047		0.0052	

Front-Half Particulate Matter Acetone Rinse Catch

	Run #1		Run #2		Run #3		Blank	
Dish #	1603		1600		1617		1619	
	Date	Weight (g)	Date	Weight (g)	Date	Weight (g)	Date	Weight (g)
Final Weight	8/29/16	6.4132	8/29/16	6.3861	8/29/16	6.4037	8/29/16	6.3389
Tare Weight (g)	3/18/16	6.4131	3/18/16	6.3736	3/18/16	6.3958	3/18/16	6.3399
Total Rinse Catch (g)	0.0001		0.0125		0.0079		-0.0010	

Total Particulate Catch

	Run #1	Run #2	Run #3
Filter Catch (g)	0.0025	0.0047	0.0052
+ Rinse Catch (g)	0.0001	0.0125	0.0079
- Acetone Blank (g)	0.0000	0.0000	0.0000
Total PM (g)	0.0026	0.0172	0.0131

Laboratory Chain of Custody Record

Project Code:	QC16-01		
Client:	Pacificorp		
Facility:	Huntington		
Unit:	#1		
Sample Date(s):	8-23-16		
Project Manager:	A. Bruning		
Sample ID / Run #	Filter ID	Tin ID	Notes
U1 R1	1002	1603	
U1 R2	1001	1600	
U1 R3	1003	1617	
U2 R1	995	1620	
U2 R2	996	1613	
U2 R3	997	1604	
Blank Tone	—	1619	
Relinquished by: <i>AB</i>			Date: 8/25
Received by: <i>MP</i>			Date: 8/25



Project PC16-0001.15
Appendix D: CEMS Data
CEMS Printouts for Test Runs

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 06:02 Through 08/23/2016 08:14

Time Online Criteria: 1 minute(s)

Source		UNIT1				
Parameter	Unit	BARPRESS (INHG)	CO2 (PCT)	OPACITY (PCT)	STKTEMP (DEGF)	UNITLOAD (MW)
08/23/16	06:02	23.810	10.7	0.6	112.65	480
08/23/16	06:03	23.809	10.6	0.6	112.87	478
08/23/16	06:04	23.810	10.6	0.6	113.23	477
08/23/16	06:05	23.810	10.6	0.6	113.08	476
08/23/16	06:06	23.811	10.6	0.6	112.76	475
08/23/16	06:07	23.810	10.5	0.6	112.25	475
08/23/16	06:08	23.811	10.6	0.6	112.52	475
08/23/16	06:09	23.810	10.6	0.6	112.53	476
08/23/16	06:10	23.811	10.6	0.6	112.43	476
08/23/16	06:11	23.811	10.7	0.6	112.28	476
08/23/16	06:12	23.811	10.7	0.6	112.33	476
08/23/16	06:13	23.812	10.6	0.6	112.43	478
08/23/16	06:14	23.812	10.6	0.6	112.67	478
08/23/16	06:15	23.812	10.5	0.6	113.21	477
08/23/16	06:16	23.812	10.5	0.6	113.42	476
08/23/16	06:17	23.811	10.6	0.6	113.19	476
08/23/16	06:18	23.812	10.6	0.6	113.29	476
08/23/16	06:19	23.812	10.6	0.6	113.18	477
08/23/16	06:20	23.812	10.7	0.6	113.17	477
08/23/16	06:21	23.812	10.6	0.6	113.38	477
08/23/16	06:22	23.812	10.6	0.6	113.41	478
08/23/16	06:23	23.812	10.6	0.6	113.46	479
08/23/16	06:24	23.811	10.7	0.6	113.46	480
08/23/16	06:25	23.812	10.8	0.6	113.48	482
08/23/16	06:26	23.812	10.7	0.6	113.38	481
08/23/16	06:27	23.812	10.6	0.6	113.29	480
08/23/16	06:28	23.812	10.4	0.6	113.44	477
08/23/16	06:29	23.812	10.4	0.6	113.34	475
08/23/16	06:30	23.813	10.5	0.6	112.99	473
08/23/16	06:31	23.813	10.6	0.6	112.93	474
08/23/16	06:32	23.813	10.6	0.6	112.66	475
08/23/16	06:33	23.813	10.7	0.6	112.53	478
08/23/16	06:34	23.813	10.7	0.6	112.54	479
08/23/16	06:35	23.813	10.7	0.6	112.80	480
08/23/16	06:36	23.813	10.7	0.6	112.80	479
08/23/16	06:37	23.813	10.7	0.6	112.93	479
08/23/16	06:38	23.814	10.6	0.6	113.32	478

F = Unit Offline

E = Exceedance

M = Maintenance

T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 06:02 Through 08/23/2016 08:14

Time Online Criteria: 1 minute(s)

08/23/16	06:39	23.815	10.6	0.6	113.38	476
08/23/16	06:40	23.815	10.6	0.6	113.41	476
08/23/16	06:41	23.816	10.5	0.6	113.36	475
08/23/16	06:42	23.816	10.6	0.6	113.09	476
08/23/16	06:43	23.817	10.6	0.6	112.87	476
08/23/16	06:44	23.817	10.7	0.6	112.70	477
08/23/16	06:45	23.817	10.7	0.6	112.84	477
08/23/16	06:46	23.817	10.7	0.6	113.08	477
08/23/16	06:47	23.818	10.6 M	0.6	113.37	477
08/23/16	06:48	23.818	10.5 IM	0.6	113.44	476
08/23/16	06:49	23.818	8.7 IM	0.6	113.24	477
08/23/16	06:50	23.818	1.2 IM	0.6	113.02	476
08/23/16	06:51	23.818	0.0 IM	0.6	112.83	478
08/23/16	06:52	23.818	0.0 IM	0.6	112.79	479
08/23/16	06:53	23.818	0.0 IM	0.6	112.83	480
08/23/16	06:54	23.819	0.0 IM	0.6	113.06	481
08/23/16	06:55	23.819	0.0 IM	0.6	112.19	481
08/23/16	06:56	23.819	0.0 IM	0.6	112.30	481
08/23/16	06:57	23.819	0.0 IM	0.6	112.68	481
08/23/16	06:58	23.818	0.0 IM	0.6	112.90	480
08/23/16	06:59	23.818	0.1 IM	0.6	112.87	479
08/23/16	07:00	23.818	0.7 IM	0.6	112.57	478
08/23/16	07:01	23.819	7.7 IM	0.6	112.63	478
08/23/16	07:02	23.819	10.9 IM	0.6	112.47	477
08/23/16	07:03	23.819	11.0 IM	0.6	112.60	476
08/23/16	07:04	23.820	11.0 IM	0.6	112.77	475
08/23/16	07:05	23.820	11.0 IM	0.6	112.68	474
08/23/16	07:06	23.820	11.0 IM	0.6	112.53	474
08/23/16	07:07	23.821	10.6 IM	0.6	112.27	475
08/23/16	07:08	23.821	6.5 IM	0.6	112.12	477
08/23/16	07:09	23.821	5.1 IM	0.6	112.20	477
08/23/16	07:10	23.821	5.1 IM	0.6	112.16	478
08/23/16	07:11	23.821	5.1 IM	0.6	112.31	477
08/23/16	07:12	23.821	5.1 IM	0.6	112.44	476
08/23/16	07:13	23.822	5.1 IM	0.6	112.37	476
08/23/16	07:14	23.822	5.1 IM	0.6	112.27	476
08/23/16	07:15	23.822	5.1 IM	0.6	112.35	475
08/23/16	07:16	23.822	9.6 IM	0.6	112.47	475
08/23/16	07:17	23.822	17.6 IM	0.6	112.40	475
08/23/16	07:18	23.822	17.8 IM	0.6	112.44	477
08/23/16	07:19	23.822	17.9 IM	0.6	112.57	478

F = Unit Offline

E = Exceedance

M = Maintenance

T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 06:02 Through 08/23/2016 08:14

Time Online Criteria: 1 minute(s)

08/23/16	07:20	23.822	18.0 IM	0.6	112.51	478
08/23/16	07:21	23.822	17.4 IM	0.6	112.60	477
08/23/16	07:22	23.822	12.2 IM	0.6	112.69	477
08/23/16	07:23	23.823	10.7	0.6	112.56	477
08/23/16	07:24	23.823	10.7	0.6	112.44	478
08/23/16	07:25	23.824	10.7	0.6	112.36	478
08/23/16	07:26	23.824	10.6	0.6	112.33	479
08/23/16	07:27	23.824	10.7	0.6	112.31	479
08/23/16	07:28	23.825	10.6	0.6	112.44	478
08/23/16	07:29	23.825	10.6	0.6	112.60	480
08/23/16	07:30	23.825	10.6	0.6	112.57	480
08/23/16	07:31	23.825	10.6	0.6	112.44	480
08/23/16	07:32	23.825	10.6	0.6	112.52	478
08/23/16	07:33	23.826	10.6	0.6	112.62	475
08/23/16	07:34	23.826	10.5	0.6	112.68	474
08/23/16	07:35	23.826	10.5	0.6	112.70	473
08/23/16	07:36	23.825	10.5	0.6	112.60	474
08/23/16	07:37	23.826	10.6	0.6	112.58	475
08/23/16	07:38	23.826	10.6	0.6	112.76	476
08/23/16	07:39	23.826	10.7	0.6	112.72	477
08/23/16	07:40	23.826	10.6	0.6	112.73	478
08/23/16	07:41	23.826	10.7	0.6	112.82	478
08/23/16	07:42	23.826	10.6	0.6	112.83	478
08/23/16	07:43	23.826	10.6	0.6	112.74	477
08/23/16	07:44	23.826	10.5	0.6	112.72	476
08/23/16	07:45	23.826	10.6	0.6	112.85	476
08/23/16	07:46	23.827	10.6 IC	0.6	112.81	476
08/23/16	07:47	23.827	12.0 IC	0.6	112.69	476
08/23/16	07:48	23.827	8.9 IC	0.6	112.59	478
08/23/16	07:49	23.828	0.4 IC	0.6	112.67	479
08/23/16	07:50	23.827	0.1 IC	0.6	112.73	480
08/23/16	07:51	23.827	0.1 IC	0.6	112.68	480
08/23/16	07:52	23.828	0.1 IC	0.6	112.74	480
08/23/16	07:53	23.827	0.0 IC	0.6	112.67	479
08/23/16	07:54	23.828	0.3 IC	0.6	112.49	478
08/23/16	07:55	23.828	0.2 IC	0.6	112.70	477
08/23/16	07:56	23.828	0.0 IC	0.6	113.00	477
08/23/16	07:57	23.828	0.0 IC	0.6	112.99	476
08/23/16	07:58	23.828	0.0 IC	0.6	112.95	476
08/23/16	07:59	23.828	0.0 IC	0.6	113.07	476
08/23/16	08:00	23.829	0.0 IC	0.6	113.13	476

F = Unit Offline

E = Exceedance

M = Maintenance

T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 06:02 Through 08/23/2016 08:14

Time Online Criteria: 1 minute(s)

08/23/16	08:01	23.829	2.0 IC	0.6	113.16	477
08/23/16	08:02	23.829	10.1 IC	0.6	113.22	477
08/23/16	08:03	23.829	10.9 IC	0.6	113.27	476
08/23/16	08:04	23.829	10.9 IC	0.6	113.40	477
08/23/16	08:05	23.830	10.9 IC	0.6	113.50	478
08/23/16	08:06	23.830	10.9 IC	0.6	113.44	479
08/23/16	08:07	23.830	11.0 IC	0.6	113.41	481
08/23/16	08:08	23.830	8.6 IC	0.6	113.57	480
08/23/16	08:09	23.830	6.8 IC	0.6	113.56	479
08/23/16	08:10	23.830	10.4 IC	0.6	113.49	478
08/23/16	08:11	23.830	10.5 C	0.6	113.75	477
08/23/16	08:12	23.830	10.4	0.6	113.63	477
08/23/16	08:13	23.831	10.5	0.6	113.10	476
08/23/16	08:14	23.831	10.6	0.6	113.08	477

Average	23.820	10.6	0.6	112.84	477
Minimum	23.809	10.4	0.6	112.12	473
Maximum	23.831	10.8	0.6	113.75	482
Summation	3,168.096	774.3	79.8	15,007.71	63,478

Included Data Points	133	73	133	133	133
Total number of Data Points	133	133	133	133	133

F = Unit Offline

E = Exceedance

M = Maintenance

T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 08:30 Through 08/23/2016 10:46

Time Online Criteria: 1 minute(s)

Source		UNIT1				
Parameter	Unit	BARPRESS (INHG)	CO2 (PCT)	OPACITY (PCT)	STKTEMP (DEGF)	UNITLOAD (MW)
08/23/16	08:30	23.832	10.5	0.6	114.47	478
08/23/16	08:31	23.832	10.4	0.6	114.37	476
08/23/16	08:32	23.832	10.4	0.6	114.02	475
08/23/16	08:33	23.832	10.5 C	0.6	113.89	475
08/23/16	08:34	23.831	10.0 IC	0.6	114.01	476
08/23/16	08:35	23.831	3.4 IC	0.6	114.04	476
08/23/16	08:36	23.831	4.3 IC	0.6	113.89	476
08/23/16	08:37	23.831	5.1 IC	0.6	113.66	476
08/23/16	08:38	23.831	5.1 IC	0.6	113.89	475
08/23/16	08:39	23.831	5.1 IC	0.6	114.45	476
08/23/16	08:40	23.831	5.3 IC	0.6	114.90	476
08/23/16	08:41	23.831	9.1 IC	0.6	114.93	477
08/23/16	08:42	23.831	10.9 IC	0.6	114.90	478
08/23/16	08:43	23.830	10.9 IC	0.6	115.15	479
08/23/16	08:44	23.831	11.0 IC	0.6	115.20	478
08/23/16	08:45	23.831	11.3 IC	0.7	114.95	479
08/23/16	08:46	23.831	16.1 IC	0.6	114.89	479
08/23/16	08:47	23.831	17.9 IC	0.7	115.20	479
08/23/16	08:48	23.831	17.9 IC	0.6	115.45	480
08/23/16	08:49	23.830	17.9 IC	0.6	115.71	479
08/23/16	08:50	23.830	17.4 IC	0.6	115.49	480
08/23/16	08:51	23.831	7.3 IC	0.6	115.05	480
08/23/16	08:52	23.831	10.0 IC	0.6	114.93	478
08/23/16	08:53	23.831	10.5 IC	0.6	115.03	477
08/23/16	08:54	23.831	10.5 IC	0.6	114.96	476
08/23/16	08:55	23.831	10.5	0.6	114.87	476
08/23/16	08:56	23.832	10.5	0.6	114.76	475
08/23/16	08:57	23.832	10.5	0.6	114.57	474
08/23/16	08:58	23.832	10.6	0.6	114.58	474
08/23/16	08:59	23.832	10.6	0.6	114.49	474
08/23/16	09:00	23.832	10.6	0.6	114.35	475
08/23/16	09:01	23.832	10.6 C	0.6	114.38	477
08/23/16	09:02	23.831	8.3 IC	0.6	114.19	478
08/23/16	09:03	23.832	2.8 IC	0.6	114.07	481
08/23/16	09:04	23.832	5.1 IC	0.6	114.27	481
08/23/16	09:05	23.831	5.1 IC	0.6	114.56	481
08/23/16	09:06	23.831	5.1 IC	0.6	114.84	478

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T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 08:30 Through 08/23/2016 10:46

Time Online Criteria: 1 minute(s)

08/23/16	09:07	23.831	5.1 IC	0.6	114.90	478
08/23/16	09:08	23.830	6.2 IC	0.6	114.65	477
08/23/16	09:09	23.831	10.4 IC	0.6	114.48	476
08/23/16	09:10	23.831	10.9 IC	0.6	114.37	475
08/23/16	09:11	23.831	11.0 IC	0.6	114.18	475
08/23/16	09:12	23.831	11.0 IC	0.6	114.31	476
08/23/16	09:13	23.831	12.4 IC	0.6	114.39	477
08/23/16	09:14	23.831	17.4 IC	0.6	114.31	477
08/23/16	09:15	23.831	17.9 IC	0.6	114.19	478
08/23/16	09:16	23.831	17.9 IC	0.6	114.04	478
08/23/16	09:17	23.831	17.9 IC	0.6	113.83	480
08/23/16	09:18	23.831	14.6 IC	0.6	113.69	479
08/23/16	09:19	23.831	7.2 IC	0.6	113.76	479
08/23/16	09:20	23.832	10.5 IC	0.6	113.88	478
08/23/16	09:21	23.832	10.6 IC	0.6	113.97	478
08/23/16	09:22	23.832	10.7 C	0.6	113.90	479
08/23/16	09:23	23.832	10.7	0.6	113.92	479
08/23/16	09:24	23.832	10.6	0.6	114.10	479
08/23/16	09:25	23.832	10.6	0.6	114.14	480
08/23/16	09:26	23.831	10.5	0.6	114.29	478
08/23/16	09:27	23.831	10.5	0.6	114.42	476
08/23/16	09:28	23.831	10.5	0.6	114.23	475
08/23/16	09:29	23.832	10.5	0.6	114.20	473
08/23/16	09:30	23.832	10.5	0.6	114.25	473
08/23/16	09:31	23.832	10.5 IC	0.6	114.00	474
08/23/16	09:32	23.831	7.7 IC	0.6	113.84	474
08/23/16	09:33	23.832	2.9 IC	0.6	113.53	476
08/23/16	09:34	23.832	5.1 IC	0.6	113.36	477
08/23/16	09:35	23.832	5.1 IC	0.6	113.58	478
08/23/16	09:36	23.833	5.1 IC	0.6	113.93	479
08/23/16	09:37	23.833	5.1 IC	0.6	113.89	480
08/23/16	09:38	23.833	6.3 IC	0.6	113.85	480
08/23/16	09:39	23.833	10.5 IC	0.6	114.06	480
08/23/16	09:40	23.834	10.9 IC	0.6	114.15	479
08/23/16	09:41	23.834	11.0 IC	0.6	113.97	478
08/23/16	09:42	23.834	11.0 IC	0.6	113.71	479
08/23/16	09:43	23.835	12.6 IC	0.6	113.68	479
08/23/16	09:44	23.835	17.5 IC	0.6	114.27	479
08/23/16	09:45	23.835	17.9 IC	0.6	114.57	478
08/23/16	09:46	23.836	18.0 IC	0.6	114.38	476
08/23/16	09:47	23.836	18.0 IC	0.6	114.38	475

F = Unit Offline

E = Exceedance

M = Maintenance

T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 08:30 Through 08/23/2016 10:46

Time Online Criteria: 1 minute(s)

08/23/16	09:48	23.836	14.1 IC	0.6	114.47	475
08/23/16	09:49	23.836	7.3 IC	0.6	114.23	474
08/23/16	09:50	23.836	10.4 IC	0.6	114.06	476
08/23/16	09:51	23.836	10.5 IC	0.6	113.96	476
08/23/16	09:52	23.836	10.6 C	0.6	113.93	476
08/23/16	09:53	23.836	10.6	0.6	114.09	477
08/23/16	09:54	23.836	10.6	0.6	114.02	476
08/23/16	09:55	23.835	10.6	0.6	113.85	476
08/23/16	09:56	23.836	10.6	0.6	114.11	475
08/23/16	09:57	23.836	10.6	0.6	114.54	475
08/23/16	09:58	23.836	10.6	0.6	114.32	476
08/23/16	09:59	23.837	10.7	0.6	114.04	476
08/23/16	10:00	23.837	10.6	0.6	113.99	477
08/23/16	10:01	23.836	10.6 M	0.6	114.11	479
08/23/16	10:02	23.836	10.7 IM	0.6	114.27	479
08/23/16	10:03	23.835	7.8 IM	0.6	114.18	479
08/23/16	10:04	23.836	1.0 IM	0.6	114.10	478
08/23/16	10:05	23.835	0.1 IM	0.6	113.99	478
08/23/16	10:06	23.835	0.1 IM	0.6	113.91	478
08/23/16	10:07	23.835	0.0 IM	0.6	114.24	477
08/23/16	10:08	23.835	0.0 IM	0.6	114.65	478
08/23/16	10:09	23.835	0.3 IM	0.6	114.69	477
08/23/16	10:10	23.835	7.1 IM	0.6	114.61	477
08/23/16	10:11	23.834	10.4 IM	0.6	114.47	476
08/23/16	10:12	23.834	10.5 M	0.6	114.27	477
08/23/16	10:13	23.835	10.6	0.6	114.16	477
08/23/16	10:14	23.835	10.6	0.6	114.09	478
08/23/16	10:15	23.835	10.7	0.6	114.23	480
08/23/16	10:16	23.835	10.7 MC	0.6	114.31	481
08/23/16	10:17	23.835	10.2 IMC	0.6	114.48	482
08/23/16	10:18	23.835	4.3	0.6	114.80	482
08/23/16	10:19	23.835	6.7 C	0.6	115.42	480
08/23/16	10:20	23.835	7.6 IC	0.6	115.78	477
08/23/16	10:21	23.835	0.6 IC	0.6	116.01	475
08/23/16	10:22	23.835	0.0 IC	0.6	115.96	473
08/23/16	10:23	23.836	0.0 IC	0.6	115.78	473
08/23/16	10:24	23.836	0.0 IC	0.6	115.74	472
08/23/16	10:25	23.836	0.0 IC	0.6	115.48	472
08/23/16	10:26	23.835	0.0 IC	0.6	115.33	473
08/23/16	10:27	23.835	0.2 IC	0.6	115.26	473
08/23/16	10:28	23.834	0.1 IC	0.6	115.23	474

F = Unit Offline

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Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 08:30 Through 08/23/2016 10:46

Time Online Criteria: 1 minute(s)

08/23/16	10:29	23.834	0.0 IC	0.6	115.30	476
08/23/16	10:30	23.834	0.0 IC	0.6	115.32	476
08/23/16	10:31	23.833	0.0 IC	0.6	115.15	478
08/23/16	10:32	23.834	0.0 IC	0.6	114.98	480
08/23/16	10:33	23.834	0.0 IC	0.6	114.98	482
08/23/16	10:34	23.833	1.5 IC	0.6	115.13	483
08/23/16	10:35	23.834	9.7 IC	0.6	115.25	483
08/23/16	10:36	23.834	10.9 IC	0.6	115.34	481
08/23/16	10:37	23.834	10.9 IC	0.6	115.32	478
08/23/16	10:38	23.834	10.9 IC	0.6	115.49	474
08/23/16	10:39	23.834	10.9 IC	0.6	115.42	474
08/23/16	10:40	23.834	11.0 IC	0.6	115.20	475
08/23/16	10:41	23.834	9.2 IC	0.6	115.38	476
08/23/16	10:42	23.834	6.4 IC	0.6	115.35	476
08/23/16	10:43	23.834	10.4 IC	0.6	115.04	477
08/23/16	10:44	23.835	10.7 C	0.6	114.89	479
08/23/16	10:45	23.834	10.6	0.6	114.83	479
08/23/16	10:46	23.834	10.6	0.6	114.92	480

Average	23.833	10.3	0.6	114.52	477
Minimum	23.830	4.3	0.6	113.36	472
Maximum	23.837	10.7	0.7	116.01	483
Summation	3,265.140	412.9	82.4	15,689.36	65,379
Included Data Points	137	40	137	137	137
Total number of Data Points	137	137	137	137	137

F = Unit Offline

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*** = Suspect**

Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 11:15 Through 08/23/2016 13:40

Time Online Criteria: 1 minute(s)

Source		UNIT1				
Parameter	Unit	BARPRESS (INHG)	CO2 (PCT)	OPACITY (PCT)	STKTEMP (DEGF)	UNITLOAD (MW)
08/23/16	11:15	23.830	10.6	0.6	114.81	480
08/23/16	11:16	23.830	10.6	0.6	114.88	480
08/23/16	11:17	23.830	10.7	0.6	114.98	478
08/23/16	11:18	23.830	10.6	0.6	115.29	478
08/23/16	11:19	23.830	10.6	0.6	115.39	478
08/23/16	11:20	23.829	10.5	0.6	115.35	477
08/23/16	11:21	23.829	10.6	0.6	115.29	477
08/23/16	11:22	23.829	10.6	0.6	115.05	478
08/23/16	11:23	23.829	10.6	0.6	114.92	479
08/23/16	11:24	23.830	10.6	0.6	114.68	479
08/23/16	11:25	23.830	10.7	0.6	114.59	481
08/23/16	11:26	23.829	10.7	0.6	114.78	481
08/23/16	11:27	23.829	10.6	0.6	115.01	480
08/23/16	11:28	23.829	10.5	0.6	115.06	478
08/23/16	11:29	23.828	10.5	0.6	115.07	476
08/23/16	11:30	23.828	10.4	0.6	115.17	474
08/23/16	11:31	23.827	10.5	0.6	115.26	474
08/23/16	11:32	23.826	10.5	0.6	115.16	474
08/23/16	11:33	23.827	10.6	0.6	115.10	475
08/23/16	11:34	23.827	10.7	0.6	115.07	476
08/23/16	11:35	23.828	10.6	0.6	115.14	478
08/23/16	11:36	23.827	10.6	0.6	115.35	477
08/23/16	11:37	23.827	10.5	0.6	115.51	477
08/23/16	11:38	23.827	10.5	0.6	115.39	476
08/23/16	11:39	23.826	10.6	0.6	115.36	475
08/23/16	11:40	23.826	10.5	0.6	115.52	476
08/23/16	11:41	23.825	10.5	0.6	115.35	477
08/23/16	11:42	23.825	10.6	0.6	115.05	478
08/23/16	11:43	23.825	10.6	0.6	115.19	480
08/23/16	11:44	23.824	10.6	0.6	115.34	481
08/23/16	11:45	23.824	10.5	0.6	115.29	480
08/23/16	11:46	23.823	10.5	0.6	115.31	479
08/23/16	11:47	23.823	10.5	0.6	115.42	478
08/23/16	11:48	23.823	10.4	0.6	115.73	475
08/23/16	11:49	23.824	10.3	0.6	115.98	473
08/23/16	11:50	23.824	10.3	0.6	115.88	473
08/23/16	11:51	23.824	10.4	0.6	115.76	472

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Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 11:15 Through 08/23/2016 13:40

Time Online Criteria: 1 minute(s)

08/23/16	11:52	23.824	10.4	0.6	115.86	473
08/23/16	11:53	23.824	10.4	0.6	115.91	474
08/23/16	11:54	23.824	10.5	0.6	115.73	475
08/23/16	11:55	23.824	10.5	0.6	115.57	476
08/23/16	11:56	23.824	10.5	0.6	115.67	475
08/23/16	11:57	23.824	10.4	0.6	115.77	475
08/23/16	11:58	23.824	10.4	0.6	115.88	474
08/23/16	11:59	23.824	10.4	0.6	115.97	474
08/23/16	12:00	23.824	10.4	0.6	116.03	475
08/23/16	12:01	23.824	6.5 I	0.6	116.23	476
08/23/16	12:02	23.823	9.0 I	0.6	116.26	478
08/23/16	12:03	23.823	10.5 I	0.6	115.84	480
08/23/16	12:04	23.822	10.6 I	0.6	115.65	482
08/23/16	12:05	23.822	10.5	0.6	115.82	482
08/23/16	12:06	23.822	10.5	0.6	115.96	481
08/23/16	12:07	23.822	10.4	0.6	116.10	479
08/23/16	12:08	23.821	10.4	0.6	116.25	477
08/23/16	12:09	23.821	10.4	0.6	116.13	477
08/23/16	12:10	23.821	10.4	0.6	115.90	477
08/23/16	12:11	23.821	10.4	0.6	115.88	476
08/23/16	12:12	23.821	10.3	0.6	115.94	475
08/23/16	12:13	23.821	10.4	0.6	116.26	475
08/23/16	12:14	23.821	10.5	0.6	116.64	475
08/23/16	12:15	23.820	10.4	0.6	116.86	475
08/23/16	12:16	23.820	10.3	0.6	116.67	475
08/23/16	12:17	23.820	10.4	0.6	116.49	475
08/23/16	12:18	23.820	10.4	0.6	116.51	475
08/23/16	12:19	23.819	10.4	0.6	116.48	476
08/23/16	12:20	23.819	10.4	0.6	116.25	476
08/23/16	12:21	23.818	10.5	0.6	115.96	477
08/23/16	12:22	23.817	10.5	0.6	116.05	476
08/23/16	12:23	23.817	10.5	0.6	116.28	477
08/23/16	12:24	23.816	10.6	0.6	116.44	479
08/23/16	12:25	23.815	10.5	0.6	116.58	481
08/23/16	12:26	23.815	10.4	0.6	116.56	483
08/23/16	12:27	23.815	10.4	0.6	116.34	483
08/23/16	12:28	23.814	10.4	0.6	116.27	481
08/23/16	12:29	23.814	10.4	0.6	116.21	480
08/23/16	12:30	23.813	10.4	0.6	116.31	478
08/23/16	12:31	23.812	10.4	0.6	116.44	478
08/23/16	12:32	23.812	10.3	0.6	116.58	476

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Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 11:15 Through 08/23/2016 13:40

Time Online Criteria: 1 minute(s)

08/23/16	12:33	23.812	10.2	0.6	116.67	476
08/23/16	12:34	23.811	10.3	0.6	116.47	476
08/23/16	12:35	23.811	10.4	0.6	116.26	477
08/23/16	12:36	23.810	10.3	0.6	116.49	477
08/23/16	12:37	23.809	10.3	0.6	116.25	476
08/23/16	12:38	23.810	10.3	0.6	116.46	475
08/23/16	12:39	23.810	10.3	0.6	116.60	475
08/23/16	12:40	23.809	10.2	0.6	116.80	474
08/23/16	12:41	23.809	10.2	0.6	116.80	473
08/23/16	12:42	23.809	10.2	0.6	116.50	472
08/23/16	12:43	23.809	10.3	0.6	116.49	473
08/23/16	12:44	23.809	10.4	0.6	116.58	474
08/23/16	12:45	23.808	10.4	0.6	116.54	474
08/23/16	12:46	23.808	10.4	0.6	116.33	477
08/23/16	12:47	23.807	10.4	0.6	115.86	481
08/23/16	12:48	23.807	10.5	0.6	115.84	485
08/23/16	12:49	23.806	10.4	0.6	116.00	486
08/23/16	12:50	23.805	10.4	0.6	116.13	485
08/23/16	12:51	23.804	10.3	0.6	116.38	481
08/23/16	12:52	23.804	10.3	0.6	116.59	477
08/23/16	12:53	23.805	10.2	0.6	116.50	473
08/23/16	12:54	23.805	10.2	0.6	116.42	472
08/23/16	12:55	23.804	10.2	0.6	116.31	473
08/23/16	12:56	23.804	10.3	0.6	116.15	474
08/23/16	12:57	23.803	10.3	0.6	116.29	476
08/23/16	12:58	23.803	10.3	0.6	116.19	477
08/23/16	12:59	23.802	10.4	0.6	116.11	477
08/23/16	13:00	23.802	10.4	0.6	116.27	476
08/23/16	13:01	23.802	10.3	0.6	116.58	475
08/23/16	13:02	23.801	10.2	0.6	116.94	475
08/23/16	13:03	23.800	10.3	0.6	116.90	474
08/23/16	13:04	23.800	10.3	0.6	116.70	473
08/23/16	13:05	23.799	10.3	0.6	116.76	474
08/23/16	13:06	23.799	10.3	0.6	116.83	475
08/23/16	13:07	23.799	10.3	0.6	116.94	476
08/23/16	13:08	23.798	10.3	0.6	117.30	477
08/23/16	13:09	23.796	10.3	0.6	117.63	478
08/23/16	13:10	23.795	10.2	0.6	117.65	478
08/23/16	13:11	23.795	10.2	0.6	117.23	478
08/23/16	13:12	23.794	10.2	0.6	116.85	477
08/23/16	13:13	23.795	10.3	0.6	116.75	477

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Average Data

Plant: HUNTINGTON PLANT

Interval: 1 Minute

Type: Block

Report Period: 08/23/2016 11:15 Through 08/23/2016 13:40

Time Online Criteria: 1 minute(s)

08/23/16	13:14	23.795	10.4	0.6	116.67	478
08/23/16	13:15	23.796	10.4	0.6	116.62	477
08/23/16	13:16	23.796	10.3	0.6	116.62	478
08/23/16	13:17	23.796	10.3	0.6	116.67	477
08/23/16	13:18	23.795	10.3	0.6	116.69	477
08/23/16	13:19	23.794	10.2	0.6	116.59	475
08/23/16	13:20	23.793	10.2	0.6	116.42	474
08/23/16	13:21	23.793	10.3	0.6	116.45	473
08/23/16	13:22	23.793	10.3	0.6	116.43	473
08/23/16	13:23	23.792	10.3	0.6	116.23	474
08/23/16	13:24	23.792	10.3	0.6	116.03	474
08/23/16	13:25	23.791	10.4	0.6	116.03	474
08/23/16	13:26	23.791	10.3	0.6	115.98	475
08/23/16	13:27	23.791	10.4	0.6	115.99	477
08/23/16	13:28	23.791	10.4	0.6	116.07	479
08/23/16	13:29	23.791	10.4	0.6	116.08	480
08/23/16	13:30	23.791	10.4	0.6	116.21	481
08/23/16	13:31	23.790	10.4	0.6	116.31	481
08/23/16	13:32	23.791	10.4	0.6	116.35	480
08/23/16	13:33	23.790	10.3	0.6	116.34	478
08/23/16	13:34	23.790	10.3	0.6	116.18	477
08/23/16	13:35	23.790	10.3	0.6	116.41	476
08/23/16	13:36	23.790	10.3	0.6	116.43	476
08/23/16	13:37	23.790	10.4	0.6	116.47	476
08/23/16	13:38	23.790	10.4	0.6	116.40	478
08/23/16	13:39	23.789	10.4	0.6	116.19	479
08/23/16	13:40	23.788	10.5	0.6	116.12	480

Average	23.812	10.4	0.6	116.07	477
Minimum	23.788	10.2	0.6	114.59	472
Maximum	23.830	10.7	0.6	117.65	486
Summation	3,476.565	1,477.5	87.6	16,946.33	69,626

Included Data Points	146	142	146	146	146
Total number of Data Points	146	146	146	146	146

F = Unit Offline

E = Exceedance

M = Maintenance

T = Out Of Control

C = Calibration

S = Substituted

*** = Suspect**

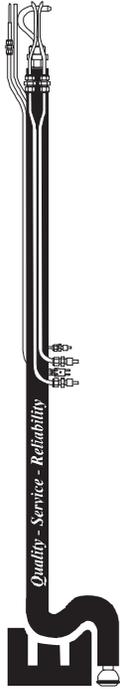


Project PC16-0001.15

Appendix E: Calibration Information

Dry Gas Meter Pre-Test and Post-Test Calibrations
Critical Orifice Calibration Certificate
AETB Certification

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



- 1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
- 2) Record barometric pressure before and after calibration procedure.
- 3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
- 4) Record data and information in the GREEN cells, YELLOW cells are calculated.

DATE: 10/17/2012 METER SERIAL #: 17465146 INITIAL 24.36 FINAL 24.36 AVG (P_{bar}) 24.36
 METER ID #: M5-3 CRITICAL ORIFICE SET SERIAL #: 1531S BAROMETRIC PRESSURE (in Hg):

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	(1) V _n (STD)	(2) V _{cr} (STD)	(3) Y	Y % Diff to Average Y	Y % Diff with other orifices	ΔH _@		
				INITIAL	FINAL	AMBIENT	DGM INLET	DGM INLET	DGM INLET									DGM OUTLET	DGM OUTLET
30	1	0.8515	14	50.931	56.389	60	61	63	60	60	3.2	4.5478	4.5495	1.000			1.81		
	2	0.8515	14	56.389	61.790	60	63	64	60	60	3.2	4.4939	4.5495	1.012			1.81		
	3	0.8515	14	61.790	67.272	60	64	64	60	61	3.2	4.5569	4.5495	0.998		0.64	1.81		
												AVG =		1.004					
18	1	0.5004	17	67.272	72.454	60	63	63	61	61	1.1	4.2825	4.2777	0.999			1.79		
	2	0.5004	17	72.454	77.654	60	63	63	61	61	1.1	4.2974	4.2777	0.995			1.79		
	3	0.5004	17	77.654	82.840	60	63	62	61	61	1.1	4.2879	4.2777	0.998			1.79		
												AVG =		0.997			-0.41		
12	1	0.3193	19	82.840	88.205	60	62	62	61	61	0.45	4.4293	4.4355	1.001			1.80		
	2	0.3193	19	93.620	98.989	60	62	62	61	61	0.45	4.4326	4.4355	1.001			1.80		
	3	0.3193	19	98.989	104.350	60	62	62	61	61	0.45	4.4260	4.4355	1.002			1.80		
												AVG =		1.001			0.06		

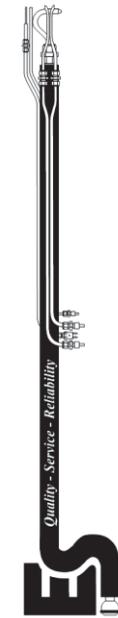
AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = **1.0008**
 AVERAGE ΔH_@ = **1.80**

$$\Delta H_{@} = \left(\frac{0.75 \theta}{V_{cr}(\text{std})} \right)^2 \Delta H \left(\frac{V_m(\text{std})}{V_m} \right)$$

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
 The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

- (1) $V_{m(\text{std})} = K'_1 * V_m * \frac{P_{\text{bar}} + (\Delta H / 13.6)}{T_m}$
 = Net volume of gas sample passed through DGM, corrected to standard conditions
 K₁ = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)
 T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)
- (2) $V_{cr(\text{std})} = K' * \frac{P_{\text{bar}} * \theta}{\sqrt{T_{\text{amb}}}}$
 = Volume of gas sample passed through the critical orifice, corrected to standard conditions
 T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)
- (3) $Y = \frac{V_{cr(\text{std})}}{V_{m(\text{std})}}$
 = DGM calibration factor
 K' = Average K' factor from Critical Orifice Calibration

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



ENVIRONMENTAL SUPPLY COMPANY

DATE: 8/19/2016 METER SERIAL #: 17465146 INITIAL: 24.53 FINAL: 24.53 AVG (P_{bar}): 24.53
 METER ID #: ME-3 CRITICAL ORIFICE SET SERIAL #: 1531s BAROMETRIC PRESSURE (in Hg):

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT ³)		TEMPERATURES °F				DGM ΔH (in H ₂ O)	(1) V _m (STD)	(2) V _{cr} (STD)	(3) Y	Y % Diff to Average Y	Y % Diff with other orifices	ΔH@		
				INITIAL	FINAL	NET (V _m)	AMBIENT	DGM INLET	DGM OUTLET								INITIAL	FINAL
23	1	0.6366	15	214.583	218.763	4.180	64	58	59	56	57	3.5166	3.4119	0.970		1.88		
	2	0.6366	15	218.763	222.951	4.188	63	59	61	57	58	3.5148	3.4152	0.972		1.87		
	3	0.6366	15	222.951	227.154	4.203	63	61	62	58	59	3.5189	3.4152	0.971	-0.61	0.05	1.87	
												AVG =						
18	1	0.4976	17	227.154	230.448	3.294	64	62	64	59	60	2.7451	2.6669	0.972		1.81		
	2	0.4976	17	230.448	233.758	3.310	64	64	65	60	61	2.7519	2.6669	0.969	-0.66	-0.05	1.81	
												AVG =						
16	1	0.4449	18	233.758	236.709	2.951	64	65	65	61	62	2.4484	2.8614	1.169		1.85		
	2	0.4449	18	236.709	240.264	3.555	64	65	66	62	63	2.8453	2.3845	0.810	1.27	1.94	1.84	
												AVG =						

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

$$(1) V_{m(std)} = K_1 * I_m * \frac{P_{bar} + (\Delta H / 13.6)}{I_m}$$

= Net volume of gas sample passed through DGM, corrected to standard conditions
 K₁ = 17.64 °R/in. Hg (English), 0.3869 °K/(mm Hg (Metric))
 T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

$$(2) V_{cr(std)} = K' * \frac{P_{bar} * \theta}{\sqrt{T_{amb}}}$$

= Volume of gas sample passed through the critical orifice, corrected to standard conditions
 T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

$$(3) Y = \frac{V_{cr(std)}}{V_{m(std)}} = \text{DGM calibration factor}$$

K' = Average K' factor from Critical Orifice Calibration

AVERAGE DRY GAS METER CALIBRATION FACTOR, Y = 0.9767

INITIAL DRY GAS METER CALIBRATION FACTOR, Y = 1.0008

% DIFFERENCE = 2.40% (Must be <5%)

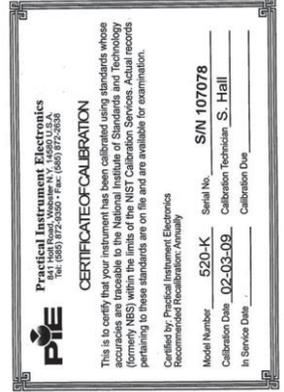
AVERAGE ΔH@ = 1.85

$$\Delta H@ = \left(\frac{0.75 \theta}{V_{cr(std)}} \right)^2 \Delta H \left(\frac{V_{m(std)}}{V_m} \right)$$

40 CFR Part 60, Appendix A-1 Method 2 §10.3: Temperature Sensors. After each field use, calibrate thermocouples at a temperature within 10% of the average absolute stack temperature. A reference thermocouple and potentiometer (calibrated against NIST standards) may be used. The absolute temperature measured with the sensor being calibrated and the reference sensor must agree within 1.5%.

Thermocouple Calibration (Using NIST-Traceable PIE Model 520 Calibrator)

Reference Value:	250
Console Value:	250
Percent Difference:	0.0%
Acceptance Criteria:	±1.5%





METHOD 5 CRITICAL ORIFICE CALIBRATION

CRITICAL ORIFICE SET SIN: **1531s**

DATE: **January 8, 2016**
 REFERENCE DRY GAS METER
 SERIAL NUMBER: **16300942**
 CALIBRATION FACTOR, Yc: **0.991**

LEAK CHECK: **Passed**

ORIFICE #	RUN #	CRITICAL VACUUM (in Hg)	TESTED VACUUM (in Hg)	Barometric Pressure per Orifice (P _{bar})	DGM READINGS (ft)		TEMPERATURES (°F)		DGM INLET	DGM OUTLET	DGM AVG	ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	K' FACTOR (english)	K' FACTOR (metric-liters)	K' FACTOR (metric-m ³)	K' FACTOR VARIATION (%)
					INITIAL	FINAL	INITIAL	FINAL									
31	1	15	17.5	29.70	67.132	73.855	6.723	70.9	74.3	74.3	74.35	6.00	4.12	0.8535	0.7092	7.0921E-04	-0.04
	2	15	17.5	29.70	73.855	80.582	6.727	70.9	74.3	74.3	74.25	6.00	4.12	0.8542	0.7098	7.0976E-04	0.04
AVG K' FACTOR =																	
23	1	15	18	29.69	80.582	86.457	5.875	71.0	74.2	74.3	74.20	7.00	2.29	0.6367	0.5290	5.2903E-04	0.01
	2	15	18	29.69	86.457	92.331	5.874	70.9	74.0	74.3	74.13	7.00	2.29	0.6366	0.5290	5.2897E-04	-0.01
AVG K' FACTOR =																	
18	1	15	18	29.69	92.331	97.588	5.257	71.0	74.1	74.4	74.25	8.00	1.44	0.4974	0.4133	4.1330E-04	-0.05
	2	15	18	29.69	97.588	102.850	5.262	70.9	74.0	74.4	74.20	8.00	1.44	0.4979	0.4137	4.1370E-04	0.05
AVG K' FACTOR =																	
16	1	15	18	29.69	102.850	108.733	5.883	71.1	74.1	74.5	74.30	10.00	1.15	0.4450	0.3698	3.6975E-04	0.03
	2	15	18	29.69	108.733	114.613	5.880	71.1	74.1	74.5	74.30	10.00	1.15	0.4447	0.3696	3.6956E-04	-0.03
AVG K' FACTOR =																	
12	1	15	18	29.68	114.613	119.720	5.107	71.1	74.0	74.5	74.20	12.00	0.58	0.3215	0.2672	2.6716E-04	-0.06
	2	15	18	29.68	119.720	124.833	5.113	71.1	73.8	74.4	74.20	12.00	0.58	0.3219	0.2675	2.6747E-04	0.06
AVG K' FACTOR =																	

K' = Critical orifice coefficient,

$$\frac{[(ft^3)(°R)^{1/2}]/[(in.Hg)(min.)]}{[(ft^3)(°R)^{1/2}]/[(in.Hg)(min.)]} - \text{English Units}$$

$$\frac{[(liters)(°K)^{1/2}]/[(mm.Hg)(min.)]}{[(liters)(°K)^{1/2}]/[(mm.Hg)(min.)]} - \text{Metric-Liters Units}$$

$$\frac{[(m^3)(°K)^{1/2}]/[(mm.Hg)(min.)]}{[(m^3)(°K)^{1/2}]/[(mm.Hg)(min.)]} - \text{Metric Units}$$

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
 Calculate the standard volumes of air passed through the DGM and the critical orifices, and calculate the DGM calibration factor, Y, using the equations in US EPA Method 5, Section 7.2.3.3 (these equations are programmed on the spreadsheet included with each orifice set).

Critical Orifice Set number **1531s** was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 5, Section 7.2

[Signature]
 Signature
 01/08/16
 Date

RE: Certification of Air Emission Testing Body (AETB) Conformance

To Whom it May Concern:

This letter is to confirm that Emissions Measurement Company LLC (“EMCo”) is an Air Emission Testing Body (AETB) operating in conformance with ASTM D7036-04, as required by 40 CFR Part 75, Appendix A §6.1.2. The table below lists the EPA Reference Methods for which each listed Project Manager is a Qualified Individual and other relevant information required by (as applicable) 40 CFR Part 75.59(a)(15), 40 CFR Part 75.59(b)(6) and 40 CFR Part 75.59(d)(4).

Emissions Measurement Company (800) 984-9883 AETB Qualified Individual Information					
QI Name	QI Email	Exam*	Exam Date	Exam Provider	Provider Email
Andrew Bruning	abruning@stacktest.us	SES Group 1	6/12/2014	SES	QSTIprogram@gmail.com
		SES Group 2	9/18/2015		
		SES Group 3	6/12/2015		
		EPA Method 30B	1/16/2015*	Ohio-Lumex	andrew.mertz@ohiolumex.com
Mike Corrigan	mcorrigan@stacktest.us	SES Group 1	4/1/2015	SES	QSTIprogram@gmail.com
		SES Group 3			
Craig Kormylo	ckormylo@stacktest.us	SES Group 1	2/5/2016	SES	QSTIprogram@gmail.com
		SES Group 3			
		EPA Method 30B	1/16/2015*	Ohio-Lumex	andrew.mertz@ohiolumex.com
Matthew Parks	mparks@stacktest.us	SES Group 1	2/5/2016	SES	QSTIprogram@gmail.com
		SES Group 2	9/18/2015		
		SES Group 3	2/5/2016		

*The Source Evaluation Society (SES) Group 1 Exam includes EPA Reference Methods 1, 1A, 2, 2A, 2C, 2D, 2F, 2G, 2H, 3, 3B, 4, 5, 5A, 5B, 5D, 5E, 5F, 5I, 17, 19, 201A and 202. The SES Group 2 Exam includes EPA Reference Methods 1, 2, 3, 4, 3B, 6, 6A, 6B, 7, 7C, 7D, 8, 11,13A, 13B, 15A, 16A, 19, 26, 26A and 202. The SES Group 3 Exam includes EPA Reference Methods 3A, 6C, 7E, 10, 10B, 20, 25A, 40 CFR Part 60 Performance Specifications 2 – 8, 15 and 40 CFR Part 75. Initial 30B training provided by Ohio-Lumex; refresher exam administered by EMCo once every five years.

Please feel free to contact me with any questions regarding the above.



Matthew Parks
Technical Director